

# Chapter 2

## Brazil

Eduardo A. Vasconcellos

Capital city	Land area	Total population	Urban population	GDP per capita	Passenger cars
Brasilia	8,511,965 sq. km	200 million	85% (170 million)	\$11,208	179 / 1,000 people



Data source: World Bank  
Maps source: [d-maps.com](https://d-maps.com)

E.A. Vasconcellos (✉)  
Brazilian Public Transport Association (ANTP), São Paulo, Brazil  
e-mail: [eavas@uol.com.br](mailto:eavas@uol.com.br)

# 1 Introduction

Starting in the 1930s, the Brazilian economy and society embarked on a major transformation from agricultural to industrial. As a result, cities in the southern states, where most industries were located, began to expand at high rates. Between 1950 and 2000, the urban population ballooned from 19 million to 161 million (80 % of the total). Thus Brazil turned into a highly urbanized nation. The pace of urbanization was particularly fast between 1960 and 1980 and resulted in 48 million additional people in the nine largest metropolises (Table 2.1).

Due to low investments in education and large differences in the power to influence public policy, Brazilian society became highly unequal, with most people living in precarious conditions and a small elite living in affluence. Income gaps between social classes became wider, and important improvements in public services did not favor those who most needed them.

For a long time, Brazil faced economic turbulence, GDP fluctuations, and middle to high inflation rates. These had an enormous impact on the livelihood of the poor and on society as a whole. In the 1990s, for the first time in the modern history of country, the *Plano Real* (real plan) managed to bring inflation under control, which subsequently allowed for important changes in urban and transport policy to occur.

In the 2000s, when the political left wing won the presidential elections, a mix of new social policies and a highly favorable international economic environment allowed the national government to provide extra monthly assistance to those in dire living conditions (about 40 million people) and a significant and permanent increase of the minimum salaries received by most workers. These two changes produced a dramatic shift in the internal market. Many people were now able to consume basic goods which were never available to them before. This also led to an increase in automobile use by the lower income portions of the population, as well as the advent of a new private transport mode: the motorcycle. Transportation-related negative externalities—pollution, congestion, traffic accidents, and urban disruption—escalated in larger cities. Due to Brazil's deep social, political, and economic disparities, the negative impacts of urbanization and motorization were unequally distributed, with the poor carrying a disproportionate burden. Their burden was made heavier by policies that supported the use of cars and motorcycles and neglected nonmotorized and public transport modes.

**Table 2.1** Population increase in the nine largest Brazilian metropolitan areas (1950–2010)

	1950	1960	1970	1980	1990	2000	2010
Population (millions)	7.9	15.3	23.8	34.1	42.2	49.5	56.3
Increase index	100	194	302	432	535	627	714
Annual rate of increase (%)	n/a	n/a	6.6	4.4	3.0	2.4	1.6
Increase in population since 1950 (millions)	n/a	7.4	15.9	26.2	34.2	41.6	48.5

*Note:* Metropolitan areas São Paulo, Rio de Janeiro, Recife, Belo Horizonte, Porto Alegre, Salvador, Fortaleza, Curitiba, Belém. *Source:* IBGE (2009)

## 2 Urban Land Use Patterns and Spatial Structure

Brazil's intense period of urban growth led to the formation of several megacities and metropolitan areas. Urbanization and land availability brought about a large amount of sprawl. On average, the (virtual) geometric radius of the main cities grew by 2–5 times (Vasconcellos 2013). Due to inadequate land use regulations and enforcement, urban expansion was uncontrolled in most cases. Poor rural migrants could not find alternative accommodations other than (legal or illegal) fringe housing thus having to travel long distances on a daily basis.

For the most part, urban road systems expanded radially. Typically, new radial roads had four to six lanes and bus services were organized along them to transport peripheral workers. In wealthy areas, some freeways and expressways were also built to accommodate an increasing number of automobiles. New residential areas were laid out according to a standard grid pattern, with roads wide enough to support ever-growing automobile use. Excess road capacity was temporarily used as free parking space for car owners (still a small portion of the population). In the 533 Brazilian cities with more than 60,000 inhabitants, building extra road capacity costs \$100 billion (Vasconcellos 2013).

In most large urban agglomerations, employment remained heavily concentrated in the historical centers, generating large unidirectional travel flows. In few cases, such as São Paulo and Rio de Janeiro, new financial or industrial employment hubs were established. In São Paulo, the role of the historical center began changing in the 1970s when a new financial district (along Paulista Avenue) managed to attract the most important business activities. In the 1990s, a third center located in the wealthiest part of the city (Berrini Avenue) housed the largest multinational companies, reflecting the ongoing globalization of the Brazilian economy. In Rio de Janeiro, while the historical center remains the largest employer, a distant high-income beachside district (Barra da Tijuca) has also become an important employment hub.

In several cities, new middle-class districts developed, with both large houses and new apartment buildings, and equipped with services appealing to this income group and its motorized lifestyle (e.g., supermarkets, international fast food chains). In some cases gated communities were built, especially in the southwestern part of the São Paulo Metropolitan Region (Alphaville) and in the Barra da Tijuca district in Rio de Janeiro (dubbed “Rio Miami”). Even the capitals of the most impoverished northwestern states, including Pernambuco, Ceará, and Alagoas, developed gated communities to accommodate an emerging middle class. In most cases, the residents of these communities became dependent on cars for transport. Typically, higher income groups lived in more central areas, which had much better provision of public services.

Meanwhile, the low-income settled in the urban peripheries, which had irregular sidewalks and roads, and poor water, sewage, and garbage collection systems. In some large cities, hilly areas were occupied, which were constantly under threat from severe landslides due to heavy summer rains. Thus the “favela” phenomenon—which had existed in Brazilian cities long before the urbanization process—reemerged. Favelas were characterized by substandard construction materials (i.e., cardboard or metal scraps). In some cases, such as in Rio de Janeiro, they were able to take over central areas, closer to work and service opportunities.

### 3 Trends in Transport Use and Mobility

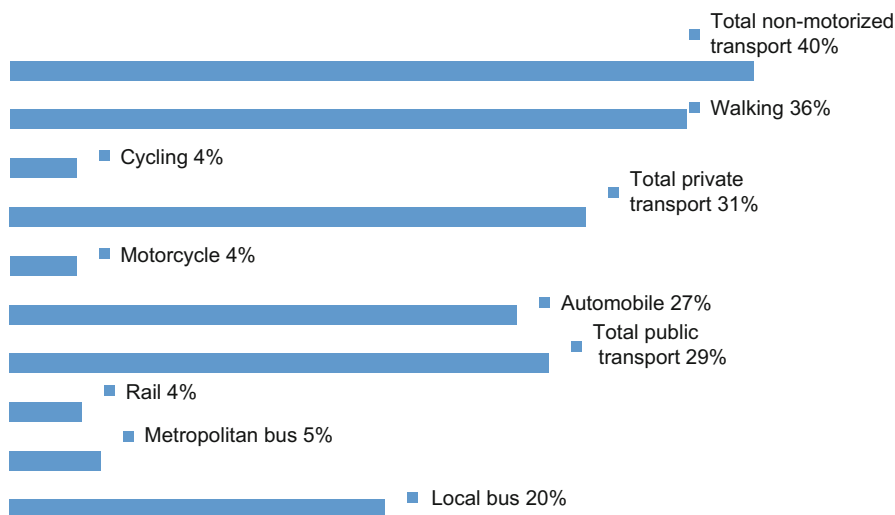
#### 3.1 Modal Share Trends

In Brazilian cities with more than 60,000 inhabitants, nonmotorized modes comprise 40 % of all trips while private and public transport account for around 30 % of the total trips each. Walking accounts for the most trips, followed by cars and buses. Bicycles, motorcycles, and rail have small shares of overall trips (Fig. 2.1).

Over recent decades, the modal share has been changing relatively slowly. However, automobile and motorcycle use have been experiencing increases. By 2005, the modal share of private motorized transport surpassed that of public transport. Meanwhile, nonmotorized modes, which have always served the largest part of the urban trips, have been decreasing in importance.

Going further back in time, data for the São Paulo Metropolitan Area between 1967 and 2007 show a clear pattern of decreasing public transport use and increasing private transport use (Fig. 2.2). The nonmotorized trip share increased in the 1970s and 1980s and then plateaued. A similar pattern was observed in other large Brazilian cities too.

The growth in motorization and car use is related to two parallel economic developments. First, in the 1950s, the political and economic elites decided to dismantle the rail networks and replace them with roads. The arrival of the first international automobile manufacturers in 1955 inaugurated a new era of support for the car. This mode began receiving a series of direct and indirect subsidies, including tax reductions, low licensing costs, free street parking, low gasoline prices, and pur-



**Fig. 2.1** Modal share (% of total trips), Brazilian cities with more than 60,000 inhabitants, 2012 data. *Source:* ANTP/SIMOB

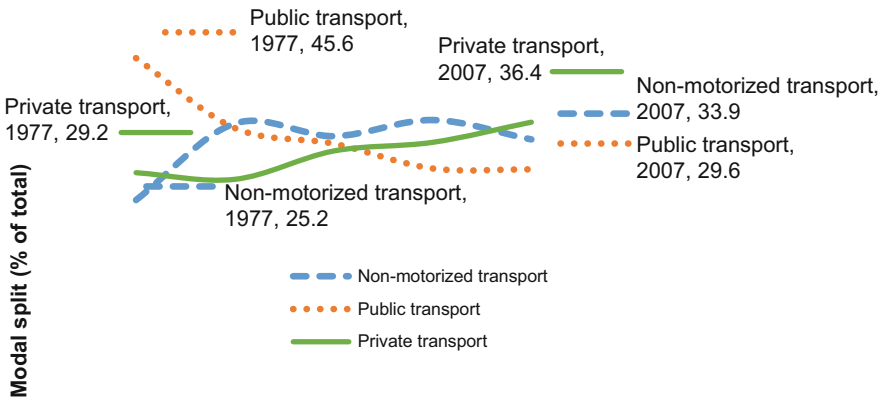


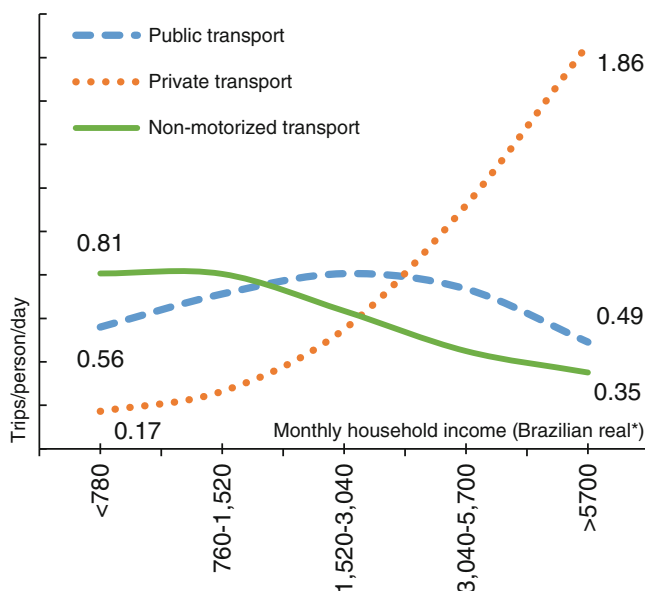
Fig. 2.2 Modal split trends in the São Paulo Metropolitan Region. *Source:* CMSP

chase credits (i.e., purchases in monthly installments for up to 7 years). Another key event was the manufacture of a low-cost compact car starting in 1993, which was sold with tax discounts and eventually took over the Brazilian market. Second, a conscious decision was made to favor the mass use of the motorcycle, which had only been a recreational vehicle for the very wealthy before the 1990s. Subsidies lowered its consumer price by 25%. As a result, the motorcycle fleet grew from 1 million in 1992 to 20 million in 2013 (Vasconcellos 2013). The out-of-pocket cost for an urban trip of 9 km (the average in large Brazilian cities) became lower for car drivers and motorcyclists than for bus passengers. With such a bias in policies and investments, a shift to private transport was unsurprising.

The extreme variation in social and economic status translates into very different mobility patterns among population groups in Brazilian cities. Very low-income families are only able to make a few trips per day, mostly on foot or by bicycle and, when money is available, on public transport. Conversely, high-income families can make many trips to fulfill their needs. Among other factors, age influences mobility in a strong way: children and the elderly are less mobile than young- and middle-aged adults. Gender has an influence too, in the sense that men are more mobile than women in terms of motorized transport but the opposite occurs with walking. The São Paulo Metropolitan Area, the largest in the country, is a typical example of the relationship between modal share and income (Fig. 2.3).

### 3.2 Public Transport

The tram and train systems which operated in several Brazilian cities in the first decades of the twentieth century were dismantled or abandoned between the 1930s and the 1970s (Orrico 1999). The two large systems of São Paulo and Rio de Janeiro were among the few that survived. However, these only provided low-quality



**Fig. 2.3** Modal share vs. income, São Paulo Metropolitan Region, 2007. *Source:* CMSP. (Asterisk) 1 Brazilian Real equals \$0.25 (2015)

services, which severely restricted the daily mobility of the poor living in peripheral areas. In Rio de Janeiro (the national capital until 1960), a number of massive demonstrations were organized to protest against the deplorable urban travel conditions, which were then suppressed by the military government.

Today, 14 Brazilian cities have rail networks in use (ANTP 2015). Only two of these networks, São Paulo's and Rio de Janeiro's, fulfill the technical definition of metro systems—with underground tracks and sophisticated operational controls. They were small relative to the size of the respective urbanized areas. The other metropolitan areas have low-quality railway systems built between the 1940s and 1950s. Exceptionally, the rail networks of Belo Horizonte, Recife, and Porto Alegre were upgraded in the 1990s.

Carless households avail themselves of bus services much more than rail service. Historically, the bus infrastructure has been limited to standard roads, where buses had to share space with automobiles and trucks. In the 1930s, when buses began to replace rail as a main urban transport mode, an assortment of vehicles was used. Bus services were mostly unregulated and provided haphazard services. In the 1950s—earlier than other Latin-American countries—Brazil started to regulate the bus industry. Individual operators of small vehicles came to be replaced by cooperatives and large formal enterprises—although minibuses still operate in favelas (Fig. 2.4). As a result, daily bus trips more than doubled in the largest cities between 1960 and 1990—from 14 to 38 million (Vasconcellos 2013). Bus fleets increased accordingly. In the 1970s, following the oil crisis, a few attempts were made to create exclusive



**Fig. 2.4** Minibus service in a poor neighborhood in Belo Horizonte. Photo by author

bus lanes but most yielded poor results and were abandoned a few years later. Curitiba's high-profile Bus Rapid Transit system was an exception (see later).

Currently, all big cities have large, integrated bus systems. The high inflation rates of the 1960s and 1970s led to increasing bus fares, which affected most families. To aid bus patrons, an employer-sponsored transport voucher (*vale transporte* or VT) was introduced in the 1980s. Employees contribute with no more than 6% of their salaries toward VT. However, informal workers, who constitute half of the Brazilian workforce, do not benefit from VT. Students receive fare discounts of 50–100% in most cities and the elderly ride for free.

Despite these efforts, conventional bus patronage has declined since the late 2000s in the face of growing automobile and motorcycle use. As a result of ever-growing congestion and the travel demand generated by major sporting events (e.g., the FIFA World Cup in 2014 and the Olympic Games in 2016), several large cities are implementing a new generation of high-quality Bus Rapid Transit (BRT) systems, based on Curitiba's leading example. Rio de Janeiro and Belo Horizonte have made the most progress in this respect.

In Rio de Janeiro, two BRT lines have been inaugurated, the Transoeste and the Transcarioca, both of which cross large areas. Their introduction has considerably reduced passenger travel times (up to 60%), as compared to regular bus services which run in mixed traffic (BRT Rio 2015). Daily demand on these corridors has surpassed expectations. In Belo Horizonte, the existing bus lanes in two major corridors have been transformed into high-standard BRTs lines (MOVE), with pre-board ticketing, digital information displays, elevated stations (level with the platform), and higher speeds.



### 3.3 Curitiba's Bus Rapid Transit System

Curitiba is capital of the state Paraná, 400 km southeast of São Paulo. Created in 1974, Curitiba's BRT system was a landmark not only in Brazil but also worldwide. It was seen as the first major transport innovation to emerge from a developing country, and it sparked a transport revolution. Many other cities were inspired to build their own BRT systems, including Bogotá in the 1990s. Curitiba's BRT now has 60 km of trunk lines, 300 km of feeder lines, 185 km of circular interdistrict routes (*interbarrios*), and 250 km of "direct" bus routes (*ligeirinhos*) which stop only at special "tube" stations—cylindrical structures made of steel and glass. Their futuristic design has done much to promote the system. The BRT is privately owned and operates without subsidies. It carries more than 1.5 million daily passengers—75 % of all weekday commuters (Fig. 2.5). This was achieved during a period of unprecedented population growth: from 300,000 inhabitants in the 1970s to 1.6 million in the city proper in 2000, and 2.3 million in the metropolitan region (Friberg 2000).

While remarkable, the BRT development in Curitiba had very little impact on other large Brazilian cities. Curitiba remained an isolated success story among several stories of failure to develop high-quality bus priority systems. For example, Porto Alegre, São Paulo, and Belo Horizonte built BRT corridors between 1977 and 1980. Campinas, Goiânia, Recife, and the São Paulo Metropolitan Region followed between 1985 and 1988. (The "ABD" corridor was built in the São Paulo Metropolitan Region, which crossed five cities.) After a long hiatus, Manaus, Fortaleza, and São Paulo implemented new bus priority schemes between 1999 and 2001. An additional corridor was created in Porto Alegre in 2004 and another one



Fig. 2.5 New, biarticulated buses in Curitiba. Photo by author



in Curitiba in 2009 (the “green corridor”). However, most of these corridors did not have fully segregated bus infrastructure and operation support. In most cases, they offered low-quality, irregular services, giving the BRT concept a negative image, which persisted for a long time.

A number of social, political, and economic factors explain the failures of other cities vis-à-vis Curitiba’s success. First, Curitiba’s civil society was active and had a long planning tradition, which was forged initially by European migrants who arrived in the twentieth century. The mayor at the time, Jaime Lerner, was not only a visionary architect but also a savvy politician. This prevailing culture was very different from other Brazilian cities. Second, Curitiba decided to build the BRT system while it was still a small city. As a consequence, the local traffic was mostly light and automobile users few. This helped avoid the sharp conflicts that arose in many other large Brazilian cities which attempted to prioritize buses by taking road space away from cars. Third, the strong linkages between local political forces and the dictatorial national government. This facilitated access to federal funds and ensured political support to the new system. However, current interest in high-standard BRTs has revived.

### ***3.4 Nonmotorized Transport***

Nonmotorized transport modes have never been taken very seriously in Brazilian transportation planning. No city can claim to have a high-quality sidewalk network and, while bicycles are heavily used in smaller cities (i.e., with up to 100,000 inhabitants), they have never received proper attention. Only a few cities, especially in the south, have invested in bicycle infrastructure—again due to the influence of European migrants. In the 1960s, pro-cycling movements spread to other parts of the country, gaining political support for the bicycle. However, cycling is still primarily seen as a weekend leisure activity for families rather than a daily commute mode. Nevertheless, several large cities now have bicycle lanes or bikeways, and these are expanding at a rapid pace (Fig. 2.6). At the same time, conflicts between cyclists and drivers and shopkeepers are increasing. The latter two groups oppose the creation of new bicycle facilities which take away parking lanes.

### ***3.5 Automobile Use***

Automobile fleets in urban areas became much larger during the economic boom of the 1970s. Purchases received another boost in the 1990s as a result of the federal actions in favor of cars, mentioned earlier. The motorization rate increased eightfold in just four decades: from 25 cars per 1000 inhabitants in 1970 to 200 cars per 1000 inhabitants in 2012. By 2009, more than half of the households had a car, a motorcycle, or both (IBGE 2009).



**Fig. 2.6** Cycling lanes along major corridors in São Paulo. Photos by author

This motorization process was directly linked to the emergence of a new middle class with strong ties to the political dictatorship that ruled Brazil until the 1990s. Urban transport policies of this era (i.e., facilitating car purchases and building vehicular roads) were designed in such a way as to adapt Brazilian cities to the needs of the middle class. This process could be labeled as “the making of middle-class cities.” Local elites were strongly supportive of other privatization reforms—in education, medical care, and leisure—adopted by the authorities, and a switch from public to private transport was the obvious next step.

Contrary to common beliefs, growing motorization in Brazil was not related to a need to establish social status but rather to a need to serve the numerous and diverse daily trips, which sustained the social and economic reproduction of the new middle class. A middle-class lifestyle would have been impossible using the existing low-quality and many unreliable bus services. Open and hidden subsidies for automobiles were obviously backed by the car industry, and encountered no major opposition by other social groups. Low levels of education and weak citizenship and political rights among the poor allowed the middle class to sway the public agenda in its own favor (Vasconcellos 1997a, b). However, public authorities were mistaken in their belief that road expansion would curb congestion and ensure free traffic flow. In São Paulo, the largest city, congestion worsened despite massive road investments: the length of congested roads in peak hours increased from 60 km in the 1990s to more than 300 km in 2010 (CET 2010).

### 3.6 *Motorcycle Use*

Throughout the 1980s, motorcycles were considered as an imported luxury good in Brazil. In the 1990s, new federal policies, including subsidies to build new motorcycle plants, facilitated the opening of a giant market for motorcycles in the country.



**Fig. 2.7** Motorcycles along major corridors in São Paulo. Photo by author

Domestically produced motorcycles could be purchased at a quarter of the price of imported ones, and in up to 48 monthly installments. At such low cost, purchases skyrocketed. The fleet grew from less than 1 million vehicles in the 1970s to more than 20 million in 2013 (Fig. 2.7).

The support for the motorcycle industry grew due to three conditions. First, multinational companies perceived a large potential market in Brazil, which was untapped until the 1970s. Second, a wave of economic deregulation highlighted the role of free markets and small businesses in large cities. Third, given that a majority of the urban population could not afford automobiles, policies favoring motorcycles found strong support among the lower middle classes. Initially, motorcycles were used by poor urban youths looking for better-paid jobs. Eventually, the low-middle classes saw motorcycles as a way to escape their tiresome public transport commutes, or as a cheap delivery vehicle for their small businesses (the latter especially in São Paulo).

The growth in motorcycle traffic has had unfortunate consequences in terms of safety. Between 1996 and 2012, some 222,000 motorcyclists died in crashes and 1.6 million suffered some form of lifetime injury. In fact, the advent of motorcycles has had the most dramatic public health impact ever seen in Brazil. Such high fatality and injury rates are partly due to the inherent vulnerability of motorcyclists traveling alongside larger and heavier vehicles but also due to a lack of safety awareness programs (Vasconcellos 2013). Recent plans in São Paulo to improve safety by creating dedicated motorcycle lanes have failed to materialize. The challenge persists.

## 4 Urban Transport Problems

Some of the main transport problems in Brazilian cities include low-quality infrastructure for nonmotorized transport, unreliable public transport services, environmental pollution, congestion, safety, and inequality in mobility and transportation access.

Clear and comprehensive policies on sidewalk construction and maintenance are lacking. In cities, the responsibilities are fragmented. Owners of lots or buildings are responsible for the maintenance of sidewalks in front of their properties. However, since policy enforcement is weak or null, sidewalks are of poor quality and in some peripheral areas they simply do not exist. As a consequence, walking is often unpleasant or unsafe. Not only does this detract from the enjoyment of the city, it also represents a barrier to public transport access. Cycling is often unsafe as the roads are poorly paved and have no dedicated infrastructure for bicycles. Cyclists try to overcome the problem by riding on sidewalks.

Public transport services are unreliable and the vehicles become overcrowded in peak hours (Fig. 2.8). In large metropolitan areas, the poor are often subject to long walking and waiting times. Economic access is also difficult for a large portion of the population. Bus fares are high relative to incomes. In 2014, the cost of a typical monthly bus pass was around 17% of the minimum salary in the country (\$300). High inflation rates at various times pushed fares up to exorbitant levels, generating massive political protests. Security in relation to public transport use is also a problem, affecting women and the elderly more than others, especially in buses which serve the less safe neighborhoods. Women tend to avoid using buses at night or if a long walk is required to reach a bus stop.



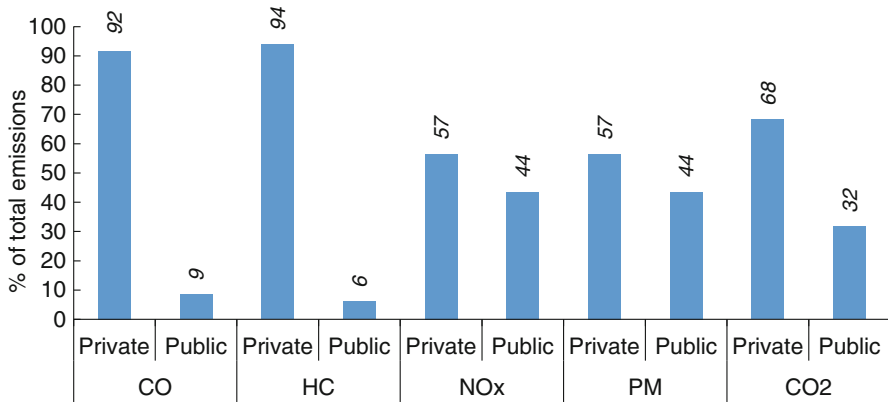
**Fig. 2.8** Peripheral bus stop in São Paulo. Photo by author

Informal settlements, favelas, have their own specific mobility patterns and issues. Among Brazil's largest cities, Rio de Janeiro has the highest concentration of favelas, most of which occupy central locations. In the last decades, favelas have increasingly come under the control of armed groups comprising both drug traffic cartels and "private police" selling protection to local residents. By the 2000s, these groups had virtually replaced the state in providing basic services and security. Violence and fear increased as a result. At that point, the government decided to reclaim these areas through a series of actions, including ostensive police interventions and sociocultural activities to liaise with local communities (through a process called "pacification").

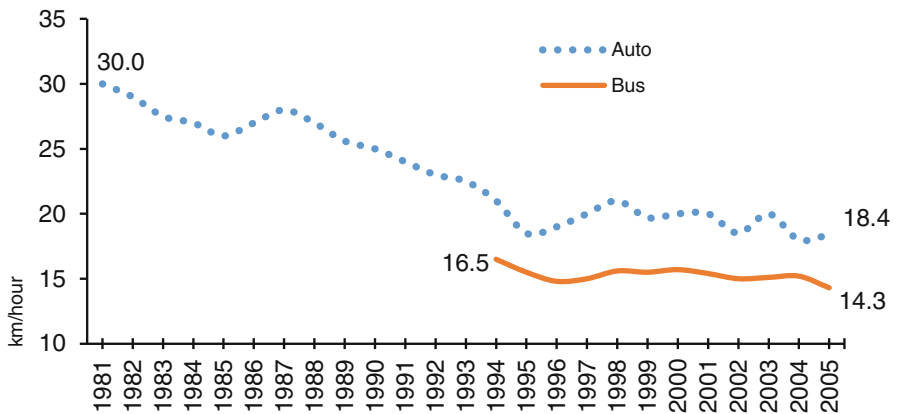
In a large mobility study of "pacified" favelas in Rio de Janeiro, it was found that vehicle ownership varies by income, gender, and age (Koch et al. 2013). Overall, bicycles are the most common vehicles, owned by only 20 % of the households, followed by cars and then by motorcycles. Vehicle ownership is predominantly male-based. Motorcycle owners are mostly youth. Local trips within the favelas are almost always on foot—only 10 % of trips are made with a vehicle. When travelling outside their favela, residents generally ride public transport. Men use more motorized modes than women while the opposite is true in case of nonmotorized modes. These gendered patterns are typical in Brazilian cities in general.

Providing transportation access to favelas situated on hillsides is a challenge since these areas have narrow and winding roads, and are typically served only by motor-taxis and small vans. Following the example of other Latin-American cities, such as Medellin and Caracas, Rio de Janeiro built in 2011 a 4-km funicular line to connect the "formal" city to "Complexo do Alemão," a large hill taken over by small favelas. The project was based on reliable technology and provided a safe and comfortable transport option for people. One trip per day was free. Stations could be reached walking or via a motor-taxi ride. However, after 4 years of successful operation, the system started losing patronage as a result of increasing local violence related to drug trafficking. Most tourists and residents began to avoid riding the funicular. Consequently, plans to extend the system to other favelas were postponed.

Environmental pollution has become a serious problem due to the growing car use and the use of low-quality diesel by buses (i.e., with high sulphur content and high emissions of particulate matter). In all cities, private transport is responsible for the largest part of emissions (Fig. 2.9). For example, CO<sub>2</sub> emissions from private vehicles are more than 80 % higher than emissions from buses. Emissions of greenhouse gases have also increased steadily, paralleling the increase in automobile and motorcycle use. In the São Paulo Metropolitan Region, the concentration of pollutants is particularly high and frequently exceeds the limits posed by the World Health Organization (Cetesb 2014). Epidemiological studies conducted by the University of São Paulo indicate that each year about 8000 people die prematurely in region due to transport-related pollution. This morbidity rate surpasses that of traffic crashes, AIDS, and breast cancer (Vormittag 2013).



**Fig. 2.9** Emissions and transport mode (São Paulo, Rio de Janeiro, Belo Horizonte, Curitiba, and Porto Alegre), 2007. *Source:* CAF (2010). *Note:* CO carbon monoxide, HC hydrocarbons, NO<sub>x</sub> nitrogen oxides, PM particulate matter, CO<sub>2</sub> carbon dioxide

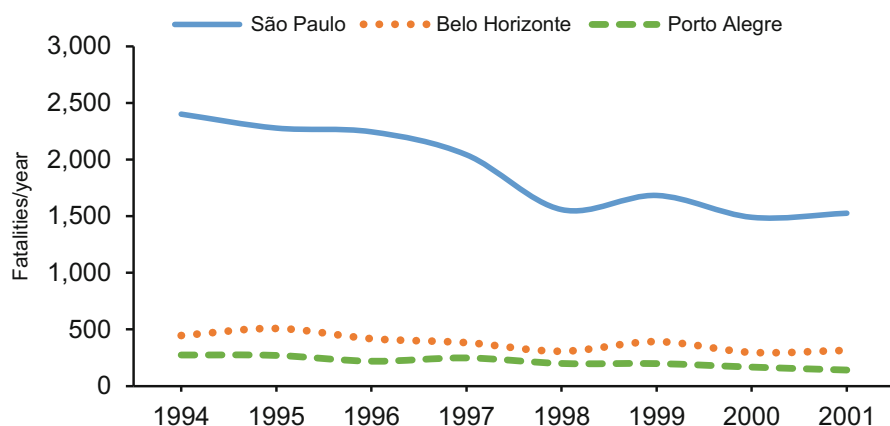


**Fig. 2.10** Congestion on major arterial roads in São Paulo. *Source:* CET

Another major problem in large cities is traffic congestion. In São Paulo, the speeds of both automobiles and buses on main arterial roads have declined significantly in the past few decades (Fig. 2.10). It is estimated that São Paulo's congestion translates into 20–25 % higher bus fares (IPEA/ANTP 1998). Other large cities face a similar problem. The average bus speeds on arterial roads are now far below 20 km/h.

In terms of traffic safety, Brazil has experienced high fatality rates since the 1950s, when motorization began to grow rapidly. Currently, the number of fatalities





**Fig. 2.11** Traffic fatalities in São Paulo, Belo Horizonte, and Porto Alegre, 1994–2001. *Source:* Vasconcellos (2013)

is around 30 per 100,000 inhabitants which is among the highest in the world. Between 1960 and 1990, a rate of 40,000 fatalities per year was reached, equaling the USA, a country where the level of motorization was ten times higher. In large cities the number of traffic deaths was exorbitant. In São Paulo, 3000 people died in traffic each year—the highest number among large cities internationally. Following the adoption of a new Traffic Code in 1997, fatalities abated only temporarily to increase again later with the upsurge in motorcycle use (Fig. 2.11).

In addition to a large numbers of vehicles on the roads, safety problems are exacerbated by poor and aggressive driving, low levels of fines for violators, unlicensed driving, weak enforcement of traffic rules, drink-driving, and poor road design. The chance that drivers at fault will be penalized is slim. Pedestrian deaths have become so commonplace that public opinion is often desensitized and dismisses the situation as “the inevitable cost of development,” “fate,” “God’s wish,” or just “caused by a few crazy drivers.” Pedestrians have historically been the most vulnerable group, followed by motorcyclists, and automobile drivers and passengers. However, fatalities involving car users and, since the 1990s, motorcyclists have escalated while pedestrian fatalities have diminished (Fig. 2.12).

In addition, there is substantial inequality in transport and “mobility metabolism” between different income groups. For example, in São Paulo, high-income groups use eight times more road space and nine times more energy than low-income groups. Moreover, high-income groups emit 14 times more local pollutants and are responsible for 15 times more road accidents than low-income groups (Vasconcellos 2005).



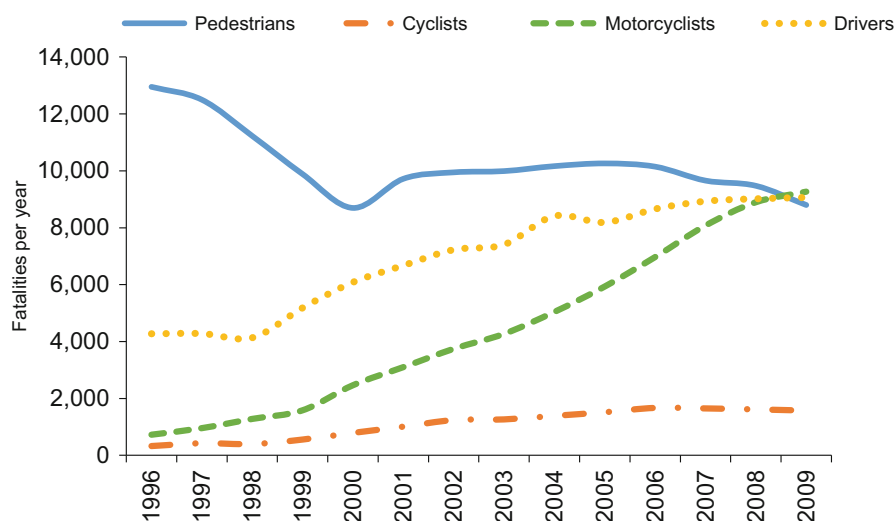


Fig. 2.12 Traffic fatalities in Brazil. *Source:* Vasconcellos (2013)

## 5 Urban Transport Governance, Decision-Making, and Financing

In Brazil, urban transport planning, public transport provision, and traffic management are primarily the legal responsibility of municipalities. Expenses are covered by the local budget. However, due to the enormous social and economic disparities in the country, many cities have minuscule budgets and cannot fulfill their transport-related tasks. Of Brazil's 5600 cities, only 500 have sufficient funds to provide an adequate urban transport system. As a result, they rely on financial help from the state and federal governments, which then leads to serious political implications. In the case of large capital investments (i.e., metros, suburban railways, and BRTs), all cities need financial support from upper levels of government. That is partly why mass transit infrastructure has developed quite slowly.

At the regional (metropolitan) level, political clashes are common. While metropolitan regions were formally created in the 1970s, the Brazilian Constitution does not confer them with decision-making powers. Only the federal, state, and municipal governments are empowered to make decisions and mayors have substantial authority within their cities. This means that metropolitan agencies, which are created by state governments, often face opposition from mayors who perceive them as encroaching on their jurisdictions. Under these circumstances, it is very difficult to reach long-term agreements on policy proposals.

In the 1990s, several legal instruments were introduced to support sustainable transport policies. However few of these had unequivocal positive effects. The most successful among these laws was a new and substantially revised Traffic Code which was adopted in 1997. The code reorganized all traffic-related administrative

procedures and significantly raised the penalties for traffic violations. In addition, it transferred the power to manage local traffic from state governors to mayors, and paved the way for the creation of local traffic and transport departments. Nowadays, all large cities have their own human and technical resources to manage their daily traffic operations. Local inspectors are empowered to impose fines on violators. As a result of this code, traffic accidents declined sharply for a period but, as mentioned above, increased again later when motorcycles came onto the market.

In 2000, the City Statute, a new ambitious planning law, was adopted. For the first time cities were required to analyze the relationship and mutual impact of land use and transport while preparing master plans. However, only a few cities were able to achieve the political consensus, institutional coordination, and financing required to implement the law. Overall, the City Statute failed to generate real changes or act as a guide to urban development.

A year later in 2001, a new tax on the oil industry was introduced: CIDE (*Contribuição sobre a Intervenção no Domínio Econômico*). The idea was to use its revenues to reduce the environmental impacts of transport, subsidize fuel purchases, and build transport infrastructure. This tax generated a large amount of funds. However, funds were gradually diverted to the Department (Ministry) of Finance in order to cover debt payments to international financing agencies. CIDE was discontinued in 2012.

In 2011, a new Mobility Law was adopted, requiring all cities of more than 20,000 inhabitants to prepare mobility plans. The law defined how mobility plans should be designed and empowered cities to restrict excessive car use in their areas. It stipulated that all mobility plans must be prepared by 2014—a deadline which has now been extended. In the face of financial and technical constraints, few cities met this target. This experience revealed, once again, that this law, as with many others in Brazil, was based on unrealistic expectations.

## **6 Proposed Urban Transport Solutions and Implementation Issues**

While the current travel conditions of most Brazilian urban residents are inadequate, several new developments might bring about some important improvements. For example, the historical neglect of pedestrians in transport planning has begun to change. Pedestrians are being formally identified as a key priority in new mobility plans. Brazilian society has begun to question why sidewalks and pedestrian signs and signals should be in such poor condition. Several nongovernmental organizations are campaigning for improvements. As a result, some new projects which normally would have ignored pedestrians now have considered their needs. Another important change is the public debate on who should pay for sidewalk construction and maintenance. Public opinion is increasingly in favor of assigning the public sector with the responsibility for building and maintaining sidewalks along main arterial roads and commercial streets.

Secondly, a country-wide movement in support of cycling has gained momentum. There have been hundreds of proposals in medium and large cities to introduce dedicated bicycle lanes (painted strips along the curb) or paths (physically separated from other vehicles). A number of nonprofit organizations have been very active in campaigning for change, organizing road safety training, and promoting collective events to gather public support. In both São Paulo and Rio de Janeiro, large cycling networks have been developed. It seems likely that they will soon expand in all major cities in the country. On the other hand, motorcycle use is still extremely problematic given the high incidence of fatalities.

Over the last 5 years, there have also been several proposals to implement bus priority schemes in most large cities. The proposed systems vary from basic curbside lanes to full BRTs, with the former being more common. The largest bus priority scheme has been created in São Paulo (300 km as of 2015) while the largest BRT system is under construction in Rio de Janeiro as part of the public improvements to host the 2016 Olympic Games. The introduction of São Paulo's bus priority scheme led to an average speed increase of 25 %. Meanwhile, in Rio's BRTs speed increases have been even higher. However, the strong differences in bus priority schemes must be considered. Systems with basic curbside bus priority lanes implemented in suburban areas tend to be very unreliable due to irregular traffic conditions in a congested environment. On the other hand, these more sophisticated bus systems (BRTs) tend to concentrate services on major corridors, and exclude unprofitable peripheries, constituting an "elitization" of bus services, which only serve central locations.

In terms of public transport more generally, it is crucial to tend to the needs of workers in the informal sector who currently do not benefit from *vale-transporte* vouchers. At the same time, a review of fare policies must take place since over 20 % of passengers are allowed to travel for free and more than 80 % receive some form of discounted fare (NTU 2005). In terms of service provision, buses need to operate with greater regularity. This could be achieved by more segregation of traffic on the road network. These roads must be well paved, free from illegal parking and not obstructed by automobile traffic if desirable bus speeds of around 20 km/h are to be achieved. These public transport upgrades could be financed through modest parking fees. Free curbside parking is currently the norm in many large cities. It is estimated that, in São Paulo alone, one million drivers park daily at no cost on public streets. Given the high number of drivers, even a small parking fee could amount to substantial annual revenues.

In the case of favelas and other slum neighborhoods, funicular transport could be very useful for providing access, especially in hilly areas. Another important investment here could be the enlargement and standardization of the existing narrow access routes. However, this would require economic compensation and relocation of some families, and is therefore likely to be controversial.

Reversing historical trend in traffic mortality is paramount. While the Traffic Code of 1997 introduced important changes that increased safety, the road environment is still of poor quality. Motorcycles traffic is chaotic, and walking and cycling are treacherous in most places. Bold measures are urgently required to lower motorcycle speed limits and separate motorcyclists from larger vehicles on fast roads. Addressing the safety problem more fundamentally requires the reappropriation of

the urban space that has been taken over by automobiles. Clearly, strong political will is required for this to happen. Newly formed progressive social movements must exert political pressure in order to overcome the obstacles created by conservative experts and politicians.

Another effective measure to improve urban transport conditions would be to charge automobile users the full cost of the social and environmental damage which they cause and to eliminate subsidies for automobile use. However, a climate prevails in Brazil where the automobile is idolized as a superior consumer good. Limiting its use is anathema to politicians, the media, and middle- and upper-income residents, an attitude rooted in low levels of education, poor citizenship, and political weakness of carless individuals and families, who are unable to speak up in defense of their own interests.

## 7 Conclusion

Urban transport policies in Brazil clearly favor automobile use and have done so for some time. Nonmotorized transport has long been neglected, thus ignoring the needs of millions of Brazilians. In most places, public transport remains very poor. The poor are captive riders of unreliable bus systems, facing long commutes and discomfort. Transport-related externalities, including pollution, congestion, traffic accidents, and urban disruption, have escalated in larger cities. As the Brazilian economy grows, the demand for private transport will grow too, thereby exacerbating current problems. To provide more equitable, accessible, and sustainable urban transport, Brazil will have to radically overhaul its urban policies and practices. However, the outlook is discouraging, for a number of reasons outlined below.

First, the legacy of the urban physical structure formed in the last five decades is problematic. Uncontrolled low-density sprawl has led to large travel distances, which are not conducive to modes such as walking and cycling. Bus passenger loads are unbalanced as service demand is higher in poor urban peripheries. This increases bus operation costs beyond a point where they cannot be recovered through affordable fares. Those with more complex mobility patterns (i.e., the middle classes and the wealthy) cannot efficiently fulfill their travel needs without a car. Sprawl is likely to continue in the future due to urban land availability, weak land-use planning and enforcement, and a mass of poor urbanites in need of shelter.

Second, Brazilian elites are strongly supportive of private transportation—both the car and the motorcycle. Even the left-wing federal government in power since 2003 has continued along the same lines as previous governments. The incentives for cars and motorcycles have increased much further, relegating public transport to a secondary role. Civil society organizations that advocate change do not have yet sufficient political power to influence policy. While they voice their ideas loudly and firmly, the political establishment strives to maintain the status quo. It is conceivable that intolerable congestion in major cities may prompt transport reform but this has not happened to date.

Third, the availability of oil has arguably been responsible for Brazil's love of cars. Since the 1930s and up to 2006, oil was imported. Thereafter, an enormous offshore oil field was discovered in the Atlantic Ocean and the country will be able to extract and use much of the oil it needs. With total oil reserves greater than 30 billion barrels, there is very little motivation to limit car use from an oil scarcity perspective.

Fourth, society's views on traffic safety are rather lenient. Unlike environmental pollution, traffic fatalities are not yet recognized as a major problem and/or an unacceptable phenomenon by all social groups and classes (Meny and Thoenig 1990). Traffic safety is often considered as an abstract concept imbued with emotional, psychological, and religious feelings rather than a concrete policy area, which requires analysis and practical solutions.

Fifth, inequity in urban transport is strongly related to the low level of "instrumental" and "political" education of the Brazilian nation. The poor have not fully acquired citizenship status, in the sense of knowing their rights and responsibilities in a democratic society, participating in politics, and voicing their needs and interests. In addition, the very unequal income distribution limits the poor from fulfilling basic needs, including the use of public transport to access work. Improving educational outcomes and household economies to a visible level may take at least two decades.

The arena that offers the most opportunities for more immediate change is environmental planning. The international environmental movement has already influenced some decisions on mobility in Brazil and the environment is continuously discussed by the media and local nonprofit organizations which have recently grown stronger. However, they still need to gain additional political leverage in order to have deeper impact on high-level policies.

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